AMBIGUITY AND ITS EFFECT ON FOREIGN POLICY DECISION STRATEGIES AND CHOICE

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ABSTRACT

Ambiguity and Its Effect On Foreign Policy Decision Strategies and Choice. (August 1996)

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While ambiguity seems to be a critical environmental factor affecting foreign policy decision-making, decision research has virtually ignored this concept in favor of others such as complexity, risk, and uncertainty. This research project examines the concept of ambiguity, distinguishing it from other environmental characteristics, and presents an experimental analysis of its effect on decision-making. Specifically, process tracing technology via the foreign policy 'decision board platform' (introduced by Mintz and Geva 1996) is used to test the application of the poliheuristic theory of decision to analyzing ambiguity and its effect upon decision strategy and choice. While the results show no linear relationship, they do indicate that ambiguity and decision strategy/choice are curvilinearly related. This suggests that there may be some optimal level of ambiguity in the decision environment—a finding that extends previous studies arguing that decision strategy and choice are linear functions of cognitive strain.

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INTRODUCTION

Foreign policy decision-makers must make sense of an extremely volatile, chaotic decision environment in order to make decisions; decisions often critical to the well-being of nations. While ambiguity—when a situation can be characterized in more than one way—seems to be a salient aspect of this 'fog' in which foreign policy decision-makers operate, decision research has virtually ignored this concept in favor of others such as complexity, risk, and uncertainty; environmental characteristics dealing with other aspects of the 'fog.' Although the latter are certainly important environmental factors deserving of the attention paid to them, research on the former is long overdue.

Experience shows that ambiguity plays an important role in the eventual outcome of a decision process. The Iraqi invasion of Kuwait is a vivid example of how ambiguity can influence a decision. According to Seyom Brown, "[w]hen Iraq began to threaten military action against Kuwait openly in the middle of July 1990, the reaction of the Bush administration was ambiguous at best" (1990, 132). Several official statements made by the Bush administration were contradictory; the U.S. Ambassador to Iraq told Saddam Hussein, in person, that the U.S. had no opinion on Arab-Arab conflicts, and, even after intelligence reports of the Iraqi buildup, a cable by President Bush to Saddam Hussein gave no clear indication of U.S. intentions. Thus, the U.S. provided no clear indication of what it would

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do if Hussein proceeded with an invasion of Kuwait. On 02 August 1990, President Saddam Hussein's forces invaded Kuwait. It is possible that, had the U.S. given President Hussein less ambiguous information, Iraq may never have invaded Kuwait or at least would have more carefully considered the consequences of doing so.

Similar effects of ambiguity can be seen in the days leading up to the Yom Kippur War. According to Yaacov Vertzberger, in spite of the growing evidence of an unusual concentration of Egyptian and Syrian forces along the Suez Canal and Golan Heights, the Israeli Chief of Military Intelligence did not revise his "assessment of the low probability of war" (1990, 58). The evidence, it seems, was ambiguous (certainly a goal of the Egyptian and Syrian intelligence strategy). "It could be interpreted as indicating offensive as well as defensive intentions" (*Ibid.*). In other words, the information presented to the Israeli decision-makers could be understood in more than one way. Quite possibly, this ambiguity may have permitted Egyptian and Syrian forces to catch the Israeli military by surprise in the ensuing attack.

While these examples may provide an intuitive notion of ambiguity, decision research has done little to provide rigor to this understanding. In an effort to provide a needed conceptualization of ambiguity, this research project examines the concept, distinguishing it from other characteristics of the decision environment, and presents an experimental analysis of its effect on decision-making.

To provide context for the following discussion, a review of the decision-making process is in order. Decision-making can be understood as a series of steps beginning with

the possession of beliefs and ultimately ending with a choice. First, a decision-maker possesses a set of beliefs or operational codes concerning the nature of the environment in which he/she operates (see Jones 1994; Jervis 1976; for a discussion of operational codes, see Walker 1983; 1986). Next, when faced with a decision task, the individual utilizes those beliefs to create a representation of the situation that he/she can understand and develops a "general goal statement regarding the task" (Payne *et al.* 1993). Following this, the decision-maker enumerates the dimensions to which the decision should contribute (e.g., a foreign policy decision may contribute to such dimensions as economic prosperity, election prospects, and military security—see James and Oneal 1991; Morgan and Bickers 1992; Ostrom and Job 1986) and also develops the list of possible alternatives to deal with the situation. In terms of a matrix representation of the decision task, these preliminary steps can be thought of as the stages comprising the formulation of a decision matrix on which can be found the alternatives arrayed across the evaluative dimensions. Once the decision matrix has been formulated, the decision-maker then moves into the information search and cognitive calculation stages of the decision process. Here, the decision-maker conducts an information search of the ratings of the alternatives along the relevant dimensions and calculates the relative value of alternatives based upon the information they view. He/she can then make a decision based upon the results of that calculation.

Although all portions of this process obviously have a significant impact upon the ultimate choice, this project focuses only on the last two steps in the process—information search/cognitive calculation and choice. This is done primarily because these stages of decision-making have received a large degree of attention in the relevant literature (see

March and Simon 1958; Cyert and March 1963; Kirkpatrick *et al.* 1976 for examples of early research focusing on the importance of information search). Moreover, "the study of procedural rationality in circumstances where attention is scarce, problems are immensely complex and crucial information is absent. . . [is] fundamental to anyone who is interested in the rational allocation of scarce resources" (Simon 1978, 14; quoted in Weiss 1982, 72). As such, the greater theoretical knowledge about these steps in the decision-making process may permit a more robust understanding of the nature of ambiguity.

Additionally, for the purposes of this research project, the information search and cognitive calculation steps of the decision process are considered to be concurrent, if not indistinguishable, steps in the decision process. This assumption is made because the separate consideration of these two steps of decision-making risks ignoring the critical effects each has upon the other. For instance, as a decision-maker views information (information search stage) a certain piece of information may have a significant effect upon the overall value of an alternative (thus, affecting the decision-maker's cognitive calculation) which may lead the decision-maker to decide not to view that alternative again (i.e. the information search had an effect upon the cognitive calculation process which, in turn, affected the search for additional information). It is therefore assumed that the processes of the search for information (within the matrix) and the cognitive calculation of utilities are inextricably linked and can be considered as a single phase of decision-making leading to choice.

In order to conduct the study of ambiguity in the information search/cognitive calculation and choice stages of foreign policy decision-making, both theoretical and empirical arguments are presented herein. In Section 2, four environmental characteristics (complexity, risk, uncertainty, and ambiguity) are defined and distinguished from each other. The next section explores the various strategies decision-makers may use to come to a decision. The section culminates in a discussion of the poliheuristic theory of decision—the theory most applicable to an analysis of ambiguity and its effect upon decision strategy and choice. Following this discussion, Section 4 highlights the linkages between the key tenets of the poliheuristic theory and ambiguity and sets forth, in theoretical form, the hypotheses to be tested in Sections 5 and 6. In conducting this analysis, this thesis addresses several questions. First, does ambiguity have an effect upon the decision strategy utilized by decision-makers? If so, how is this effect manifested? Second, does ambiguity likewise have an effect upon the accuracy of the choice arrived at by the decision-maker? In other words, does ambiguity affect the decision-maker's propensity to select the 'optimum' alternative (i.e. accuracy)? Finally, does the decision-maker's decision strategy, whether or not affected by ambiguity, also have an effect on accuracy?

Sections 5 and 6 then present the research design and results of the experiment used to examine the above questions. Specifically, process tracing technology via the foreign policy 'decision board platform' (introduced by Mintz and Geva 1996) is used to test the application of the poliheuristic theory of decision to analyzing ambiguity and its effect upon decision strategy and choice.

The results show that ambiguity and decision strategy/choice are curvilinearly related. This suggests that there may be some optimal level of ambiguity in the decision environment—a finding that contradicts previous studies arguing that decision strategy and choice are linear functions of cognitive strain. The present findings are, however, compatible with some decision research—see Schroder *et al.* 1967, Streufert and Swezey 1986).

Finally, Section 7 concludes by discussing the implications of the findings and suggests possible avenues for further research on ambiguity.

SECTION 2

THE FOREIGN POLICY DECISION ENVIRONMENT

Many scholars have noted that the international arena is fraught with a host of characteristics (e.g. complexity, risk, and uncertainty, among others) that threaten the efficacy of foreign policy decisions. Indeed, "accounts of foreign policy crises, such as the Teheran hostage rescue mission or the Cuban Missile Crisis, show that decision-making environments are often in a constant state of flux. . . . Thus, it is not surprising to see that foreign policy crises are often characterized as somewhat chaotic situations wherein information is presented to and received by a leader in a rather complex and varied fashion" (Mintz *et al.* 1996, 1).

Political scientists have tried improve their understanding of this chaos by identifying important environmental factors or characteristics common to the relevant cases. Specifically, three characteristics of the decision environment are dominant in the foreign policy decision-making literature: complexity, risk, and uncertainty. As will be seen, the concept of ambiguity also belongs among these characteristics. Although these environmental characteristics, including ambiguity, are often used interchangeably, important differences between them serve to distinguish each from the others.

Complexity seems to have received the most attention in decision research. The concept has been variously defined in terms of the amount of information available to the decision-maker (Weiss 1982), the number of alternatives faced by the decision-maker (Payne

1976; Olshavsky 1979; Schroder *et al.* 1967; Payne *et al.* 1992), or the number of dimensions on which to rate alternatives (Schroder *et al.* 1967; Latham and Yukl 1975; Payne 1976; Olshavsky 1979; Payne *et al.* 1992), or any combination of the above. Additionally, some researchers have added the idea of the rate of information change (Schroder *et al.* 1967; also noted in Payne *et al.* 1992). Common to each of these definitions is the more general understanding of complexity as the cognitive load placed upon a decision-maker (Campbell and Gingrich 1986). Hence, for the purposes of this paper, complexity is considered to be an 'umbrella' concept referring to cognitive load under which may be located the concepts of risk, uncertainty, and ambiguity.

The classical notion of risk posits a situation in which "each option leads to one of a set of possible outcomes and where the probability of each outcome is known" (Levy 1992, 172).[1] Put differently, "risk is a situation where the probability of each outcome given each action is definable and known to all actors" (Morrow 1996, 29). Moreover, risk differs from certainty in that the probability associated with each outcome is neither one nor zero; i.e. it is not certain. While it is recognized that risk is a multi-dimensional phenomena (see Billings and Milburn 1976), at the heart of the concept lies the notion of risk as a situation where a probability, not equal to one or zero, is associated with each possible outcome.

The decision to raid Entebbe, as described by Zeev Maoz, provides an example of a situation characterized by risk. In late June 1976, the Israeli government was faced with a crisis situation involving the hijacking of an Air France plane. "On board were 160

[1] Note that, for the purposes of this paper, it is assumed that, under conditions of risk and uncertainty, only one outcome is associated with each alternative.

passengers, of whom 103 were Israeli citizens" (Maoz 1981, 687). By the time the hijacked plane had landed at Entebbe, Uganda, Israeli decision-makers were well under way trying to develop a set of alternatives to deal with the crisis. According to Maoz, "the decision-makers dealt with only two options: negotiation with the hijackers and a military rescue operation" (*Ibid.*, 691). While negotiation was less favorable politically than a successful military operation, the risk associated with the military option was high enough that Israeli decision-makers initially settled with negotiation. As the crisis developed, however, and more information became available to the military planners, the likelihood of realizing success with a military rescue operation rose from a from an initial rating of 0.32 to a 0.62 probability of success (*Ibid.*, 692). As a result, the Israeli government decided to raid the airport.

The classical notion of risk has often been compared to that of uncertainty. Generally, uncertainty has been variously defined as a situation characterized by a lack of information (Billings and Milburn 1976), a lack of rules for dealing with a decision (Heradstveit and Bonham 1986), or the 'need to guess' (Payne *et al.* 1992). Thus, it is not surprising that, "[t]he literature on how people make judgments under uncertainty is large, complex, and rife with controversy" (Einhorn and Hogarth 1985, 433). Nevertheless, studies in psychology and foreign policy decision-making have tended to rely on the classical operational notion of uncertainty. The classical operationalization of the concept argues that uncertainty can be thought of as a situation in which "the probabilities of outcomes are not completely known" (Levy 1992, 173). In such a case, "probability distributions reflect an actor's degree of belief about the likelihood of outcomes given an action" (Morrow 1996,

29). How this 'degree of belief' changes within and between decision-makers and situation is at the heart of the study of uncertainty. As will be seen later, cognitive heuristics provide one way to describe changes in 'degrees of belief.'

An article by Heradstveit and Bonham (1986) provides a good example of a foreign policy decision environment characterized by uncertainty. "From the period 18 June to 13 August 1978, more than a dozen Soviet ships were observed to be anchored or lying still in Norwegian territorial waters. In Oslo there was much concern about the incidents and what, if anything, they indicated about the Soviet Union. . . . The boat incidents were quite unexpected and there was great uncertainty about how to interpret them" (Heradstveit and Bonham 1986, 339). Put simply, the Norwegian officials could have decided to interpret the actions of the Soviet Union as either benign or hostile. They could not, however, assign probabilities to the correctness of either interpretation due to the uncertain nature of the situation. Thus, they were faced with an extremely difficult decision resulting from the uncertainty associated with each possible 'outcome' of their decision.

The classical notion of uncertainty, however, only provides the groundwork for much of the work on uncertainty that has followed (e.g., Payne *et al.* 1992; Billings and Milburn 1976; Vertzberger 1990). Payne *et al.* (1992), for instance, begin with the classical notion of uncertainty in their discussion of decision theory, but stress that rules of probability are not applicable to the analysis of uncertainty, as they are with respect to risk. Billings and Milburn (1976) take the analysis a step further arguing that uncertainty exists at every step of the decision process and is, hence, a multidimensional phenomena. In doing so, they also

argue that different kinds of uncertainty lead to different information search processes in making a decision. Unfortunately, however, they do not adequately identify the different forms of uncertainty, leaving that task to further research.

Such further research can be found in Vertzberger's work on decision-making (1990). In The World in Their Minds, Vertzberger argues that complex uncertainty, which can generally be thought of as a lack of reliable information, exists along several separate dimensions, two of which are directly applicable to this discussion. First, foreign policy decision-makers are often faced with a lack of information about the probability associated with each outcome (the classical notion of uncertainty). Second, Vertzberger argues that foreign policy decision-makers may face a lack of clear information about the range of possible alternatives. As will be seen later, this dimension of complex uncertainty is more akin to the definition of ambiguity proposed herein.

While these expanded notions of uncertainty tap important variations in the concept, at the core of all of these approaches is the classical notion of uncertainty; e.g. the lack of knowledge about the probability associated with each outcome ($p = ?$).

In many cases of foreign policy decision-making, however, the decision-maker does not necessarily have the luxury of knowing the possible outcome associated with each alternative, much less knowing the probability associated with that outcome. In such cases the decision-maker must make sense of an ambiguous environment. Because of its prevalence in foreign policy decision-making, this environmental characteristic should be central to the study of the decision environment and its effect upon decision strategy and

choice. Unfortunately, however, it has not received the same attention in decision research as have the other three characteristics.

In the various attempts to address ambiguity (see Vertzberger 1990; March and Olsen 1979; Heradstveit and Bonham 1986; Einhorn and Hogarth 1985; Levine 1985), many scholars have offered conceptualizations of the concept that are only marginally applicable to the environmental characteristic described above. Vertzberger offers a very general definition of ambiguity as a "lack of situational clarity" (1990, 385). His definition echoes the work of March and Olsen who identify four types of ambiguity specific to organizations and their performance: the ambiguities of intention, understanding, history, and organization (1979, 12). In its totality, however, March and Olsen's typology of ambiguity simply identifies four sources of this 'lack of situational clarity.'

Many scholars have simply equated ambiguity and uncertainty. For example, when Heradstveit and Bonham (1986) discuss the uncertainty faced by Norwegian government officials, they use the terms uncertainty and ambiguity interchangeably.

Some, however, have attempted to provide a more thorough theoretical treatment of the idea of ambiguity in their analysis of decision-making. In such an attempt, Einhorn and Hogarth (1985) present an operational conceptualization of ambiguity that can be used in the analysis of decisions, foreign policy or otherwise. They argue that ambiguity can be thought of as '2nd order uncertainty,' or the uncertainty about an uncertainty. To explain, they cite the work of Ellsberg (1961):

> Imagine two urns, each containing red and black balls. In Urn 1, there are 100 balls, but the proportions of red and black are unknown; Urn 2 contains 50 red and

> 50 black balls. Now consider a gamble such that, if you bet on red and it is drawn from the urn you get $100; similarly for black. However, if you bet on the wrong color, the payoff is $0. Imagine having to decide which color to bet on if a ball is to be drawn from Urn 1; that is, the choices are red (R_1), black (B_1), or indifference (I). What about the same choices in Urn 2: (R_2), (B_2), or (I)? Most people are indifferent in both cases, suggesting that the subjective probability of red in Urn 1 is the same as the known proportion in Urn 2—namely, 0.50. However, would you be indifferent to betting on red if Urn 1 were to be used versus betting on red using Urn 2 (R_1 vs. R_2)? Similarly, what about B1 versus B2? Many people find that they prefer R_2 over R_1, even though their indifference judgments within both urns imply that $p(R_1) = p(R_2) = 0.50$ (Einhorn and Hogarth 1985, 434).

Given this paradoxical pattern of response, Einhorn and Hogarth argue that the key difference between the two gambles lies in the nature of the uncertainty associated with each one. Specifically, there can be only minimal confidence when one attempts to assess the uncertainty associated with Urn 1, while in Urn 2 "one is at least certain about the uncertainty in the urn" (*Ibid.*). The authors argue that this distinction between the two urns can be thought of as a function of 2nd order uncertainty, or ambiguity.

While compelling, Einhorn and Hogarth's work does not capture the essential distinction between uncertainty, as it is defined classically, and the situation in which the decision-maker must make a decision with information about neither a single outcome nor its associated probability. In addition, closer analysis of Einhorn and Hogarth's argument shows that their conceptualization of uncertainty is closely related, if not equivalent, to that of the classical notion of risk; and their notion of ambiguity is more analogous to the classical definition of uncertainty presented above (namely, the knowledge of outcomes without their associated probabilities). It seems that another avenue for defining ambiguity must be explored.

The work of Donald Levine may suggest a stronger conceptualization of ambiguity than those used in the literature reviewed. In his book *The Flight From Ambiguity*, Levine argues that "experiential ambiguity signifies a property possessed by any stimuli of having two or more meanings or even simply of being unclear as to meaning" (1985, 8). This notion of ambiguity is quite similar to the second dimension of complex uncertainty proposed by Vertzberger (1990)—namely, the lack of reliable information concerning the range of possible alternatives. In each of these two conceptualizations, the authors identify a situation capable of being understood in more than one way. This approach to the concept of ambiguity seems better to capture the environmental characteristic described above—namely, a situation in which the decision-maker possesses neither information concerning an alternative's outcome nor the probability associated with that outcome.

Hence, for the purposes of this research project, ambiguity is defined as a situation in which the outcome associated with each alternative can only be represented as a range of possible outcomes. Note also, that this conceptualization implies that increasing the range between possible outcomes corresponds with an increase in ambiguity in the decision environment.

While it is acknowledged that ambiguity, like risk and uncertainty, is a multi-dimensional phenomena, this particular dimension of ambiguity captures an environmental characteristic not previously studied and is, hence, considered to be of importance to the study of foreign policy decision-making.

Recall the examples cited in the introduction. In the first, Saddam Hussein may have been able to characterize the possible U.S. response along a range. Put another way, Hussein's analysis of the outcome of his decision to invade Kuwait, with respect to the United States, may have only produced a set of possible outcomes ranging from no response to full military reaction. In the second example, quite simply, the Syrian and Egyptian military activities could have been interpreted as being either offensive or defensive.

Returning to the case of the Gulf War, when Iraq began to threaten Kuwait, Hussein may have faced ambiguity in attempting to determine how the Iraqi public would react to the planned invasion of that country. By Hussein's estimation, the invasion could garner a great deal of support for Hussein's demonstration of resolve, or it could result in widespread discontent at openly challenging the United States. Thus, Hussein may not have had a clear indication of the Iraqi public's possible reaction. As a result, Hussein could only have characterized the possible public reaction along a range, varying from support to discontent.

SECTION 3

HEURISTICS AND THE POLIHEURISTIC THEORY OF DECISION

It is not enough, however, to identify environmental characteristics that impact the foreign policy decision-maker. As implied in the introduction, the characteristics of the decision environment actually have an effect upon the decision strategies utilized by decision-makers (see Payne *et al.* 1992; Kahneman and Tversky 1982; Vertzberger 1990). It is also not enough to simply rely upon rules of statistics and probability for understanding decision-making under ambiguity, as is done with risk. Under conditions of uncertainty and ambiguity, decision-makers more often utilize intuitive judgments that do not follow the laws of probability. "The fact that such intuitive judgments often deviate from the laws of probability is now widely accepted" (Payne *et al.* 1992, 102; see also Schwenk 1984; Kahneman and Tversky 1982; Milburn and Billings 1976; Vertzberger 1990). Therefore, another approach must be taken in order to understand the dominant trends associated with these intuitive judgments used by decision-makers to deal with ambiguity.

According to many current scholars, decision-makers, when "faced with highly complex information, the ramifications of whose potentially relevant aspects all need to be considered integratively, decision-makers often prefer to apply heuristics...over algorithms" (Vertzberger 1990, 144). Heuristics are 'non-optimal rules of thumb' that permit the decision-maker to make sense of an extremely ambiguous (among other characteristics) environment with a minimum of cognitive effort. Much of the salient research on decision

heuristics has identified heuristics found to operate in the matrix formulation stages of decision-making: prior hypothesis bias, anchoring and adjustment, and availability to name a few.

A prior hypothesis bias exists when the decision-maker forms erroneous beliefs based upon prior assumptions and then acts upon those beliefs, often in the face of information contradicting those beliefs (Levine 1971; Jervis 1976). Alternatively, a decision-maker may favor the use of an anchoring and adjustment process in order to evaluate deviations from a pre-selected reference point (Kahneman and Tversky 1979). When utilizing this heuristic, a decision-maker anchors their judgment on this 'pre-selected reference point' and then adjusts their judgments as they become aware of additional information. Yet another cognitive short-cut is the availability heuristic. "The availability heuristic refers to the assessment of the probability of an event based on the ease with which instances of that event come to mind" (Payne *et al.* 1992, 103). Hence, "an estimate that a certain policy is doomed to fail may depend on the ease and speed with which the decisionmaker can imagine the various difficulties to be encountered" (Vertzberger 1990, 149).

These heuristics are only a few among a wide variety of different strategies used by decision-makers to cope with a chaotic and fluid foreign policy decision-environment in order to create a decision matrix.[2] These heuristics do not, however, indicate how a decision-maker may operate once they have already formulated the decision matrix. At this point in the decision, the alternatives and dimensions have been established and all that

[2] Please note that, in this thesis, no distinction is made between decision heuristics and decision strategies.

remains is to survey the available information and use that information to make a decision. While this process may seem straightforward at first, many factors may still increase the cognitive demand placed upon a decision-maker as they try to make their way through the decision matrix. As noted by Mintz *et al.*, "[t]he common denominator of the variables that mediate the onset of decision strategies seems to center on the cognitive demands imposed by the decision task (Olshavsky 1979; Russo and Dosher 1983). The heavier the demands, the more likely is the decision-maker to employ simplifying heuristics" (1996, 12). Hence, certain decision heuristics may also operate in the information search/cognitive calculation stages of decision-making. Specifically, as identified in the work of Mintz and associates (Mintz 1993; Mintz *et al.* 1995; Mintz and Geva 1996; Mintz *et al.* 1996), decision-makers may employ non-compensatory, non-holistic, dimension-based search, and satisficing heuristics in order to alleviate cognitive strain.

The non-compensatory heuristic is in operation if a low dimension rating of an alternative cannot be compensated for by a higher score on any other rating of that alternative. For instance, it has been demonstrated that "leaders do not make tradeoffs across dimensions in order to compensate for a negative or a low score (utility) on the political dimension" (Mintz *et al.* 1995, 4). Political leaders, virtually as a rule, do not engage in any action which will serve to undermine their political fortune. "This corresponds to the notion that politicians are loss averse" (*Ibid.*). This heuristic serves to simplify the decision task by permitting the early exclusion of alternatives deemed unacceptable. This frees the decision-maker to lend more time and cognitive effort to other alternatives that may meet *a priori* cost thresholds.

Alternatively, decision-makers employ the non-holistic strategy when they do not examine all of the possible information in the decision environment. In fact, the non-holistic heuristic implies that decision-makers will not even examine all of the information available to him or her. The use of this heuristic permits the decision-maker to avoid the higher cognitive strain associated with examining all available information in order to make his/her choice.

The third heuristic that may be employed during this stage of decision-making is the dimension-based information search. Given a decision matrix, the decision-maker may either examine all of the information along an alternative and eventually compare all alternatives (alternative-based search), or they may compare the dimensional performance of the alternatives and then move on to the next dimension (dimension-based search). As has been demonstrated by a host of research (Russo and Rosen 1975; Olshavsky 1979; Payne *et al.* 1988), the use of a dimension-based framework serves to reduce the cognitive complexity of a decision-task by permitting simple comparisons between alternatives along a single dimension as opposed to across all dimensions.

Finally, decision-makers may utilize a satisficing heuristic when they make a decision. In such an instance, the decision-maker selects the first alternative that meets a set of bottom-level criteria. This is opposed to the maximizing principle under which the decision-maker selects the best alternative from the set of all fully analyzed alternatives. This heuristic serves to alleviate cognitive strain by permitting the decision-maker to select an alternative after reviewing a limited amount of information. Moreover, such a heuristic also

allows the decision-maker to concentrate on the somewhat easier task of reducing the costs of a choice; as opposed to the consideration of both reducing costs and maximizing gains.

As may be evident from the above discussion of heuristics, decision-makers may utilize several different heuristics in a single decision. Indeed, certain heuristics (e.g. satisficing rule) necessitate the employment of others (non-holistic information search) in the decision task.

Additionally, as with the heuristics associated with the matrix formulation stages of decision-making, the decision environment may have an effect upon the heuristics employed by a decision-maker. Indeed, different environmental characteristics lead decision-makers to utilize different decision heuristics (see Schroder *et al.* 1967; Payne *et al.* 1992; Kahneman and Tversky 1982; Vertzberger 1990; see also the series of articles by Mintz and associates). In other words, decision-makers tend to utilize a host of different decision strategies in order to make a decision. As will be seen, of the four theories used to study foreign policy decision-making (rational choice, cybernetic, prospect, the poliheuristic theories), only one theory accounts for this wide range of possible decision strategies—the poliheuristic theory of decision.

Rational choice theory is based upon three broad assumptions. First, decision-makers are capable of ranking all possible states of the world in regard to their desirability, "that is, [they] can rank the outcomes from best to worst, allowing for the possibility of ties in the order" (Morrow 1996, 3). "Second, decision-makers know the connection between the strategies they may choose from and desired goals, or evaluated states, of the world.

Third, decision-makers optimize" (Jones 1994, 37; see also Bueno de Mesquita and Lalman 1992). Implied in these three assumptions is that decision-makers will conduct an 'exhaustive' search of the relevant information in order to come to a choice. Contrary to most conceptions of the rational model of decision, however, the search for information does not necessarily have to be exhaustive. "Actually an exhaustive search among alternatives would itself be irrational in a cost/benefit sense: such a search would consume more in resources, such as time, than could be expected from the probable benefits that would accrue from the newly discovered alternatives. So most decision theorists assume that information in a search process is subject to the law of declining marginal returns" (*Ibid.*, 38). In sum, the rational choice theory argues that decision-makers attempt to maximize their utility in a decision through a systematic search for information and a comparison of the utilities associated with each alternative.

With respect to environmental characteristics, rational choice theory is only marginally applicable. When dealing with risk, rational decision-makers are hypothesized to multiply the utility associated with each outcome by its probability to develop an 'expected utility' for each outcome. Once this has been completed for each alternative, then a choice may be made by selecting that alternative which maximizes expected utility. With respect to conditions of uncertainty, rational choice decision-makers tend to utilize more intuitive processes which mirror probabilistic reasoning. "An important characteristic of analytic estimators is the qualified and probabilistic judgments they make" (Stein and Tanter 1980, 28). Even under conditions of uncertainty, however, the rational decision-maker's search strategy is considered to be holistic (at least insofar as the marginal benefit of new

information exceeds its costs).

Cybernetic decision theory, however, takes issue with some of the implicit assumptions of rational choice theory (see Steinbruner 1974). As is noted by Stein and Tanter, "[t]hey may be incapable of extensive search when uncertainty and complexity are high" (1980, 32). Within this theory, the link between strategies and desired end states is not as strong as is postulated by the rational choice theory. On the contrary, cybernetic decision-makers typically employ decision strategies that have been proven in the past or are part of organizational norms and operating procedures. "Cybernetic decision-makers ... strive to minimize the calculations they must perform.... They monitor a small set of critical variables, and their principal value is to reduce uncertainty by keeping these variables within tolerable ranges. ... The sequence of decisional behavior is related less to an intellectual analysis of the problem at hand than to past experience, from which there emerges an almost institutional approach to problem-solving" (Dougherty and Pfaltzgraff 1990, 480). Thus, cybernetic decision-makers utilize previously tested decision rules to come to a decision. These rules do not necessarily meet all assumptions of rational choice theory, but do allow the cybernetic decision-maker to make sense of a 'difficult' decision environment. Under the cybernetic theory of decision, the search for information is limited to a specific set of information predetermined by previous experience. Hence, this theory implies that decision-makers may actually 'overlook' uncertainty or ambiguity in the decision environment in favor of remaining faithful to pre-selected decision-making routines. Moreover, cybernetic decision-makers use a decision rule of satisficing, a decision rule that is in keeping with 'bounded rationality' (Simon 1956).

Prospect theory, the third of the major decision theories, provides a counterpoint to the expected utility approach to dealing with risk. Introduced by Kahneman and Tversky in 1979, this theory "posits that individuals evaluate outcomes with respect to deviations from a reference point rather than with respect to net asset levels, that their identification of this reference point is a critical variable, that they give more weight to losses than to comparable gains, and that they are generally risk-averse with respect to gains and risk-acceptant with respect to losses" (Levy 1992, 171). As such, prospect theory deviates from some of the key assumptions of rational choice theory by arguing that decision-makers do not necessarily maximize utility in making decisions. According to this theory, decision-makers tend to focus more on an 'arbitrary' reference point as well as the risk associated with each option. While this theory explicates deviations from the expected utility approach to risk, it does have implications for uncertainty and ambiguity. With respect to uncertainty, if the decision-maker constructs an intuitive likelihood estimate, they may demonstrate the effects of the risk-acceptance dynamic in their choice between alternatives. Similarly, under conditions of ambiguity, decision-makers may exhibit tendencies to select certain alternatives based upon the range of possible outcomes. In such a case, it could be that risk-acceptant decision-makers would be more prone to select those options characterized by a wide range of possible outcomes while more risk-averse decision-maker's would favor less ambiguous alternatives.

The poliheuristic theory of decision-making, introduced in several articles by Mintz and Geva (1996; see also Mintz, Geva, and DeRouen 1994; and Mintz 1993), integrates "key elements of two disciplines involved in the study of foreign policy decision-making:

cognitive psychology and political science" (Mintz *et al.* 1995, 4). The theory is based upon the assumption that decision-makers use a variety of strategies and heuristics to develop a decision. Thus, the poliheuristic theory's main contribution to decision research is its concentration on both process (specifically, its concentration on the analysis of changing heuristics in the face of a changing decision environment) and outcome.

Given each of the above discussions of the various decision theories, the poliheuristic theory of decision may best explain how decision-makers cope with an ambiguous environment. This is because the other three decision theories do not adequately account for ambiguity in the decision environment (rational choice theory precludes non-holistic information searches and limits the applicability of non-probabilistic reasoning; the cybernetic theory skirts the consideration of ambiguity by implying that decision-makers may 'overlook' ambiguity in the decision environment; and prospect theory is specifically applicable to risk and only directly applicable to certain dimensions of ambiguity) nor do they account for the use of multiple decision strategies to come to a choice. The poliheuristic theory, however, may better account for the presence of ambiguity in the decision environment (this is discussed in more detail in the following section) and incorporates, as its key argument, the use of multiple decision strategies in order to come to a decision. Therefore, the poliheuristic theory of decision will be used in this thesis to conduct an analysis of ambiguity and its effect on decision strategy and choice.

Before proceeding with the discussion of the poliheuristic theory and ambiguity, a brief discussion of the theory's primary tenets is in order. The key arguments of the

poliheuristic theory are that (a) decision-makers use a variety of decision strategies "en route to a single choice," and (b) different decision strategies may be employed in order to cope with different situations as a function of environmental and personal variations (Mintz *et al.* 1996, 4).

With respect to (a) above, Mintz *et al.* 1995 argue that decision-makers tend to use a two-stage process in analyzing a set of alternatives arrayed across a set of dimensions. In the first stage, the individual screens alternatives in order to reduce the choice set, using a primarily dimension-based search strategy. In the second stage, the decision-maker utilizes a more holistic, alternative-based search of the narrowed choice set to make the final decision.

The second key argument of the poliheuristic theory identifies the information search/cognitive calculation heuristics discussed above (non-compensatory, non-holistic, dimension-based search, and satisficing decision rule heuristics) and argues that they are employed by the decision-maker differentially to deal with cognitive strain in the decision task.

Given the preceding discussions of ambiguity, the various heuristics that may be utilized in the information search/cognitive calculation stage of decision-making, and the poliheuristic theory of decision-making, how does the poliheuristic theory of decision explain how decision-makers cope with ambiguity?

SECTION 4

THE POLIHEURISTIC THEORY AND AMBIGUITY

The poliheuristic theory of decision has two implications for the analysis of how foreign policy decision-makers cope with an ambiguous decision environment: process and outcome (i.e. choice) implications.

With respect to its implications for process, the poliheuristic theory of decision argues that the decision environment may have an effect upon the heuristics/strategies used by a decision-maker. Put another way, "the strategy that a decision-maker employs is very often contingent upon, among other things, the difficulty of the task being undertaken" (Mintz *et al.* 1996, 4). Hence, as noted previously, decision-makers utilize decision heuristics to help alleviate cognitive strain in the decision task.

In keeping with this line of argument, it is hypothesized that cognitive strain will vary as a function of ambiguity. Specifically, as ambiguity in the decision environment becomes more prevalent, the cognitive strain experienced by the decision-maker increases. Recall that, under this conceptualization, as ambiguity in the decision environment rises, the range between possible outcomes of the alternative increases. As this occurs, the task of calculating utilities for each alternative along the different dimensions becomes more difficult since the overall utilities associated with each alternative (assuming the decision-maker is even capable of calculating a meaningful utility in the face of ambiguity) overlap and make the alternatives appear to become more similar. As noted by Stone and Schkade, "[t]he

cognitive effort required to compare two alternatives is directly related to the similarity of the alternatives. Similar alternatives require finer, more precise discriminations, thereby increasing the effort required to make a choice" (1991, 44). Hence, the presence of ambiguity in the decision environment makes the decision task more difficult.

Faced with such a situation, the decision-maker may try to alleviate increasing cognitive strain through the use of simplifying heuristics. One way that this is accomplished, as implied by Russo and Dosher (1983), is for the decision-maker to utilize a more dimensional search pattern as it is cognitively easier and, therefore, aids in coping with ambiguity.[3] In addition, a dimension-based strategy may be utilized not only because it is, itself, cognitively less stressful, but also because it may directly act to reduce the effects of ambiguity. The decision-maker, when presented with a piece of ambiguous information, will look to other information in order to put that piece of information in context, so as to better evaluate it. This additional information is most likely located along the same dimension as the first piece of information since all information along a dimension is similarly measured. In this way, dimension-based processing helps to provide a somewhat clearer picture in the face of rising levels of ambiguity. It is therefore hypothesized that the decision-maker, under conditions of increasing ambiguity, will resort to dimension-based processing in order to compare ambiguous pieces of information.

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[3] As with Mintz *et al.* (1995; and 1996), this paper concentrates on dimensional versus alternative-based decision strategies. This is done because, "other processing characteristics are known to be highly correlated with these patterns of information acquisition (see Ford *et al.* 1989)" (Mintz *et al.* 1996, 24).

In terms of the two stage decision process posited by Mintz and Geva (1996), the decision-maker will tend to rely more on the first stage of the decision process, utilizing a more dimensional process, under conditions of rising ambiguity. This hypothesis simply follows from the first; if a decision-maker utilizes a more dimension-based search strategy as ambiguity increases, then they will, by definition, rely more upon the first stage of the decision process than on the second. Moreover, relying more upon the first stage of the decision process permits the decision-maker to eliminate alternatives from consideration. Since ambiguity makes the comparison of several alternatives more difficult, it stands to reason that the decision-maker will endeavor to eliminate as many alternatives as possible before proceeding to a more alternative-based, and hence more difficult, search strategy. Thus, it is hypothesized that as ambiguity increases, the decision-maker will tend to increasingly emphasize the first stage of the decision process.

The poliheuristic theory of decision also has implications for the outcome/choice of a decision. What, then, are the effects of ambiguity on the decision-maker's ability to select the 'optimum' alternative?[4]

As noted by Mintz *et al.*, "the selection of a particular strategy affects choice (see e.g. Payne *et al.* 1988). . . .evidence shows that choices made while processing information by alternative are often very different than choices made while employing dimension (or attribute) based processing (Ford *et al.* 1989)" (1995, 8). Along these lines, Herek *et al.*

[4] While the label 'optimum' may be considered subjective, in this thesis it identifies the alternative which maximizes utility as compared to the other alternatives in a decision, and is used as a benchmark for the comparison of choice.

(1987) found significant correlations between process and outcome. They found that alternative-based strategies produced outcomes that led to better consequences while the use of simplifying heuristics may lead to poorer outcomes (see also Stein and Tanter 1980). Therefore, given the above relationships, it is hypothesized that a decision-maker's propensity to select the 'optimum' alternative (i.e. his/her accuracy) will decrease as they increasingly resort to simplifying heuristics—a result of rising ambiguity.

The effects of ambiguity, however, may be mediated by the degree of familiarity the decision-maker has with the decision task he/she faces. Before discussing this issue, however, it is important to discuss familiarity and its effect upon decision strategy. Mintz and Geva (1994) found that the familiarity of the decision-maker with the choice set of the decision task has an effect upon his/her decision strategy. "Information search patterns were compared for scenarios containing familiar and unfamiliar alternatives and the findings revealed that a dimension-based pattern is characteristic of the unfamiliar (and therefore more cognitively demanding) scenarios, whereas an alternative-based search is more common in situations where the decision-maker is familiar with the choice set" (Mintz *et al.* 1995, 7). Hence, so as to confirm previous research, the same relationships (between familiarity and decision strategy) will be examined in this research project.

In addition to the relationship between familiarity and decision strategy, familiarity may also mediate the effects of ambiguity on decision strategy/choice. A decision-maker in a familiar choice setting possesses *a priori* beliefs about the choice set with which they are faced, beliefs which may allow them to be less dependent upon the information provided

them. If this is true, then the decision-maker who is less dependent upon information will be less susceptible to the effects of ambiguity than will be the decision-maker in the unfamiliar setting who is more dependent upon the information provided him/her. Therefore, it is hypothesized that the effects of ambiguity will be more pronounced in unfamiliar choice settings than in the familiar decision tasks.

To summarize, the various hypotheses discussed above and tested in this thesis are as follows:

1. a. Decision strategy will vary as a function of ambiguity. As ambiguity increases the search strategy will become more dimension-based.

   b. As with prior research, decision strategy will vary as a function of familiarity. Decision-makers in a familiar choice setting will exhibit more of an alternative-based search strategy than those in the unfamiliar decision task.

   c. The effects of ambiguity on decision strategy will vary as a function of familiarity. The effects of ambiguity on decision strategy will be more pronounced under unfamiliar decision conditions than under the familiar choice setting.

2. a. Decision-makers change decision strategies during the decision task. Specifically, decision-makers utilize a two-stage decision process in which the first stage is characterized by a more dimension-based search strategy while the second stage is more alternative-based.

   b. Change in decision strategy will vary as a function of ambiguity. There is an direct relationship between level of ambiguity and amount of time spent by a decision-maker in the first stage of the decision process.

3. Choice will vary as a function of ambiguity via decision strategy.
   There is an inverse relationship between the dimensionality of the search strategy and accuracy. As the decision strategy becomes more dimension-based, the decision-maker's accuracy will decrease.

Having delineated the hypotheses to be tested, the next section presents the methodology used to conduct those tests.

SECTION 5

METHODOLOGY

The Foreign Policy Decision Board Platform

The decision board platform is a computerized, research tool designed by Mintz and Geva and used in their work on the experimental analysis of decision-making (1996; 1995; see also Mintz *et al.* 1996) The basic structure of the decision board platform is a matrix of alternatives and dimensions on which the alternatives are evaluated. The typical decision task involves a choice between A_i alternatives which are judged along D_j different dimensions. The values inside the matrix (the portions of the matrix that contain these values are called 'information bins') represent the evaluation of an alternative on a specific dimension (V_{ij}). The various evaluations are accessed by the click of a mouse. Choices are registered by the computer when the subject selects the choice box of the desired alternative.

The computer records the order in which information bins (IBs) are opened, the alternative selected, and the amount of time elapsed from the initiation of the task until the choice is made. This information can then be statistically analyzed to identify trends in the decision processing characteristics of the subjects.

As in Mintz *et al.* (1995; and 1996), two foreign policy scenarios (decision tasks) were used to "introduce concrete alternatives and dimensions" (8). The first scenario deals with a military dispute between two small islands over the control of a large uranium field

(see Mintz, Geva, and DeRouen 1993). The subsequent invasion of one of the islands by the other results in a crisis situation (including the taking of foreign citizens as hostages) to which the decision-maker must respond. The decision-maker is presented with four alternatives: use of force (attacking the invader), containment (naval blockade), international sanctions against the invader, and isolationism (do nothing). The second scenario involves the choice of a site for a new U.S. naval base in the Pacific. The decision-maker, in this situation, is supposed to choose between four islands: Alpha, Beta, Charlie and Delta.

These two scenarios were used not only to introduce 'concrete alternatives' but also to provide the opportunity to measure the variable of familiarity with the choice set discussed in the previous section. With regard to the first scenario, "[p]revious experiments demonstrated that such a scenario was *familiar* to the subjects, i.e., they held *a-priori* beliefs about what such alternatives entailed, and they had *a-priori* preferences for certain alternatives" (1996, 9). In the second scenario, however, decision-makers have no such *a-priori* preferences for certain alternatives as each of the four islands are fictitious; hence, this decision task is considered unfamiliar to the subjects.

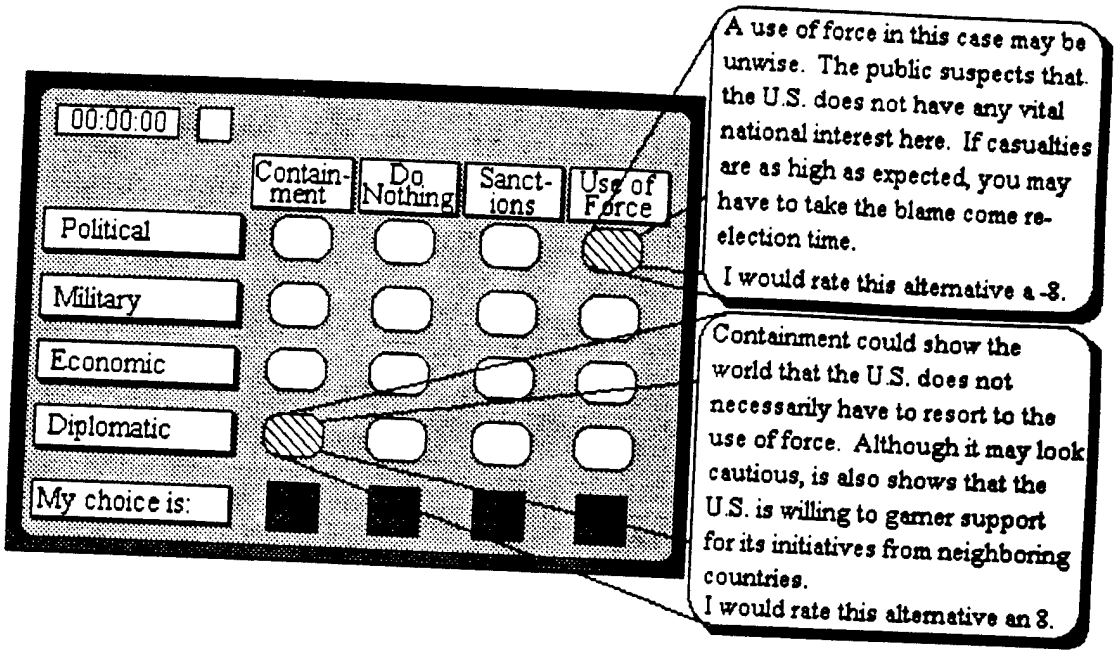
The dimensions used in both contexts represent themes found to be relevant in past studies of foreign policy decision-making (James and Oneal, 1991; Morgan and Bickers, 1992; Ostrom and Job, 1986). These dimensions are *political, military, economic, and foreign affairs (diplomatic)*, and are used to evaluate each of the above alternatives. As stated above, the value V_{ij} is a summary of the utilities that alternative A_i has on dimension

D_j. "For instance, the decision-maker can speculate, on the basis of his/her stored beliefs (Taber and Steenbergen 1994), what the impact of the use of force on the political dimension is. She or he may evaluate the use of force costly in terms of public approval" (Mintz *et al.* 1996). Given such an evaluation, the decision-maker can 'assign' a low score (say, V=-10 or -9; on the -10 to 10 scale) to this alternative on the political dimension. Not only can decision-makers develop their own evaluations, but, more importantly, the evaluations may also come from external sources of information and advice. Indeed, as is recognized by a wide variety of literature, the roles played by advisors in the decision-process is crucial to the outcome of a decision task (see Russett and Starr 1992; Burke and Greenstein 1989). "An advisor, such as the chief economic advisor, may tell the chief executive that 'do nothing' can be very beneficial to the nation's trade deficit, implying a high score (say, V=9) for this alternative on the economic dimension" (Mintz *et al.* 1996). Therefore, as with previous studies using this platform, the alternatives and their utilities were introduced as being provided by important advisors to the decision-maker: the "Chief Political Advisor," the "Chairman of the Joint Chiefs of Staff," the "Chief Economic Advisor," and the "Secretary of State." The information provided by each of these advisors corresponds thematically with each of the dimensions identified previously (e.g. political, military, economic, and foreign policy).

Following the definition of the above alternatives and dimensions, the actual values (V_{ij}) were inserted into the matrix. These values consisted of an evaluative descriptive statement and a summarizing numeric value (on a scale from -10 to 10) which provided the

dimension rating for a specific alternative.[5] Figure 1 depicts the foreign policy decision board, and provides examples of two information bins:

Figure 1. The Foreign Policy Decision Board Platform



The Experiment

Subjects. Seventy-five military officers from the faculty and staff at the United States Air Force Academy (65) and Texas A&M University (10—from the Texas A&M ROTC Detachments) participated in the experiment. The subjects (1 Brigadier General, 3 Colonels, 11 Lieutenant Colonels, and other officers) possess many years of experience as decision-makers involved in national security and defense related decisions.

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[5] In order to replicate as closely as possible previous studies using the decision board platform, care was taken to preserve the ordinal rankings among the values of V_{ij}.

Design. The basic structure of the experiment was a 3 x 2 between groups factorial design.[6] The two factors were as follows: 1) Ambiguity (denoted as NA—no ambiguity; RA_2—mid-level ambiguity; RA_4—high-level ambiguity); and 2) Familiarity with the Choice Set (unfamiliar versus familiar alternatives). The dependent variables, as with Mintz *et al.* (1995; and 1996), "consisted of several process tracing parameters of decision-making: information acquisition patterns. . . and the specific choices subjects made" (1996, 11).

Research Material. As has been argued in previous research (Olshavsky 1979; Russo and Dosher 1983), the cognitive demands imposed by the decision task seem to mediate the onset of decision strategies. Thus, the heavier the cognitive load, the more likely it is that decision-makers will utilize simplifying heuristics. In this experiment, variations in cognitive demand were introduced by: a) manipulating the degree of ambiguity faced by the decision-maker; and b) manipulating the familiarity of the choice set. Additionally, the order of alternatives was manipulated so as to provide a control for order-induced effects on decision strategy and choice.

(a) Manipulation of *ambiguity*: For the purposes of this study, the numerical evaluations provided by the 'advisors' were altered to reflect increasing levels of ambiguity. This was done by increasing the range of the numerical evaluations presented to the subject. In the first condition, no ambiguity (NA), every IB contains a single numerical evaluation. For example, the final sentence in the IB would read, "I would rate this alternative a 4." In

[6] An additional control factor, the order of alternatives, was also included and is explained in the Research Material discussion.

the second condition, medium level ambiguity (RA_2), the numerical ratings are presented as a range of values. In this setting, the range equals two and the mean of the range is the same as the corresponding IB in the first setting. For example, the final sentence in the IB would read, "I would rate this alternative somewhere between 3 and 5." In the final condition, high level ambiguity (RA_4), the range is increased to four while the mean remains the same. In this case, the final sentence would read, "I would rate this alternative somewhere between 2 and 6." Note that the verbal evaluations provided by the "advisors" do not change.[7]

(b) Manipulation of *familiarity*: As was discussed earlier, the unfamiliar choice set involved choosing a site for a new U.S. naval base from among four hypothetical islands in the Pacific. The familiar choice set contained alternatives (the use of force, containment, economic sanctions, and isolationism) for handling an international dispute between two island nations.

(c) Controlling the *order of alternatives*: The order of alternatives was manipulated so as to control for any bias introduced by a single order of alternatives. Due to problems associated with obtaining a high number of subjects, only four orders were used in the study. These four orders were selected based upon the same logic as that behind the Latin square. As such, each of the orders can be considered to be 'orthogonal' to each other.[8]

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[7] The verbal evaluations do not change across levels of ambiguity partly to control for the 'translation' of verbal statements to their numeric representation (see, for example, Stone and Schkade 1991); changing the verbal evaluations may introduce effects not measured by the experiment. Thus, the verbal evaluations were created such that they would be applicable to all conditions of range ambiguity.

[8] The orders utilized in this experiment were: Alternatives A C B D; Alternatives B D C A; Alternatives C A D B; and Alternatives D B A C. As can be seen, the order of alternatives is completely different in each case—no alternative is in the same location between orders.

As with prior studies, all of the decision-makers were subjected "to time pressure manipulation. Subjects were told that there was a time constraint and the decision board screen presented a timer that beeped every fifteen seconds" (Mintz *et al.* 1996, 13). It is important to note, however, that the subjects were not actually restricted on the amount of time available to them.

The Research Instrument. A decision-board with a 4x4 matrix (alternatives by dimensions) was utilized for this experiment. Again, the same research instrument as previous studies was used for this research:

> The decision board was programmed as a SuperCard application for Macintosh. The decision matrix employed in this study consists of 16 'information bins' (IB). These bins contain information pertaining to the evaluation of a given alternative along a specified dimension. . . .Figure [2] shows the values used in this experiment to evaluate the four alternatives along the four dimensions. A particular "IB" could be viewed only once. After the subjects made their decision, they clicked on the choice button beneath the corresponding alternative (Mintz *et al.* 1996, 11-12).

Figure 2. The Decision Matrix: Evaluations of Alternatives Across Dimensions

	Alternative A	Alternative B	Alternative C	Alternative D
Political	0	7	1	-8
Military	-7	0	6	5
Economic	2	-6	4	6
Foreign Affairs	8	2	-8	2

The numbers presented here correspond to the NA condition of ambiguity. The values for the other conditions of ambiguity have the same means but have ranges of 2 and 4, for mid-level and high-level ambiguity, respectively.

Procedure. The experiment was administered in computer labs at the U.S. Air Force Academy and Texas A&M University where each subject was able to operate individually on a computer. The instructions and decision scenarios were displayed on the computer screen. The program began with a brief practice session designed to familiarize the subject with the decision board platform and then moved on to the actual decision task with which we are interested.

Subjects were instructed to select the best alternative from among the four presented to them. In order to "sensitize subjects to the loss aversion dynamic" (Mintz *et al.* 1996, 24), the instructions to the subjects stated that "the quality of the decision you make in the context of the simulation will suggest your ability to comprehend national level decision making." Upon completion of the decision task, the subjects completed a brief questionnaire and were given a debriefing on the experiment.

SECTION 6

RESULTS

This statistical analysis examines three aspects of decision-making. First, this section discusses the effects of the decision environment (ambiguity and familiarity) on the strategy utilized by the subjects. Second, the link between decision environment and choice (via strategy) is explicated.

Before proceeding, it is important to note a factor critical to these results. Given the breadth of the experimental design (2 x 3 x 4: familiarity, ambiguity, and order, respectively)[5] the number of subjects used in this experiment (n=75) is extremely small. Thus, the results reported herein should be considered somewhat unstable. As such, they could be improved immeasurably by the use of additional subjects. Nevertheless, the results that follow do indicate significant patterns supportive of the study's hypotheses and warrant further research.

Strategy Selection

As noted previously, the poliheuristic theory of decision-making argues that decision-makers utilize a number of different strategies in order to make a decision. As noted in Section 4, this paper concentrates on dimensional versus alternative-based strategies.

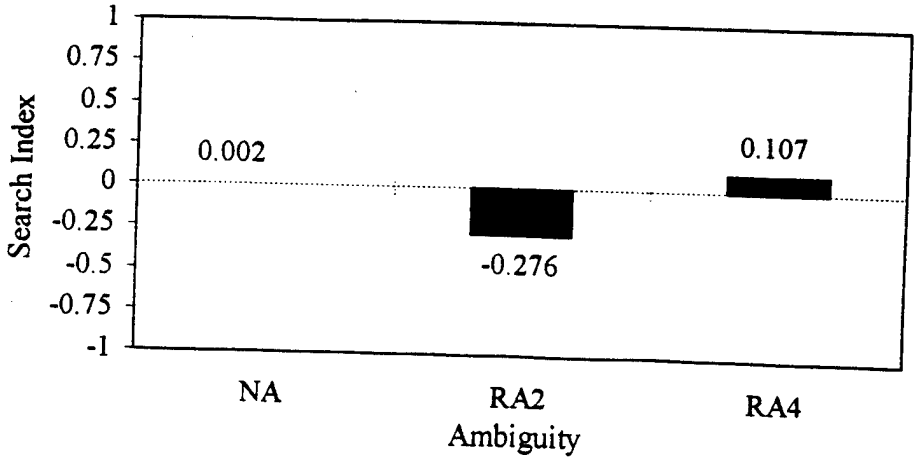
[5] Since there were no *a-priori* hypotheses concerning the influence of the order of alternatives, the data analyses reported are collapsed across this variable implying a basic 2 x 3 model.

Alternative versus Dimension-based Strategies. Following previous research (Mintz *et al.* 1995; and 1996), the information search index created by Billings and Scherer (1986) is used to measure the strategy used by the subject in 'moving' through the decision matrix. The number of alternative moves (defined as moves within an alternative and between dimensions; i.e. vertical), the number of dimension moves (defined as moves within a dimension and between alternatives; i.e. horizontal), and the number of 'shifts' (defined as moves between both dimensions and alternatives; i.e. diagonal) are tallied and then applied to the Search Index equation (SI = (a-d)/(a+d)). Positive search indices indicate a more alternative-based strategy, while negative search indices indicate a more dimensional strategy.

Given this measure, it was found that no linear relationship existed between the level of ambiguity and search strategy, a finding unsupportive of Hypothesis #1a. The use of a polynomialc contrast for the analysis, however, showed that ambiguity had a significant, curvilinear impact upon the strategies employed by decision-maker—$F(2,72) = 2.48$ $p<0.07$, as is shown in Figure 3.[6] Specifically, when subjects were faced with a relatively unambiguous decision environment (NA), they tended to use a more alternative-based decision strategy ($M = 0.002$) than when faced with mid-level ambiguity (RA_2: $M = -0.276$). When faced with high levels of ambiguity (RA_4), however, the subjects seemed to revert back to a more alternative-based strategy ($M = 0.107$).

[6] Please note that, since the hypotheses tested herein are directional, all of the results are reported as one-tailed tests.

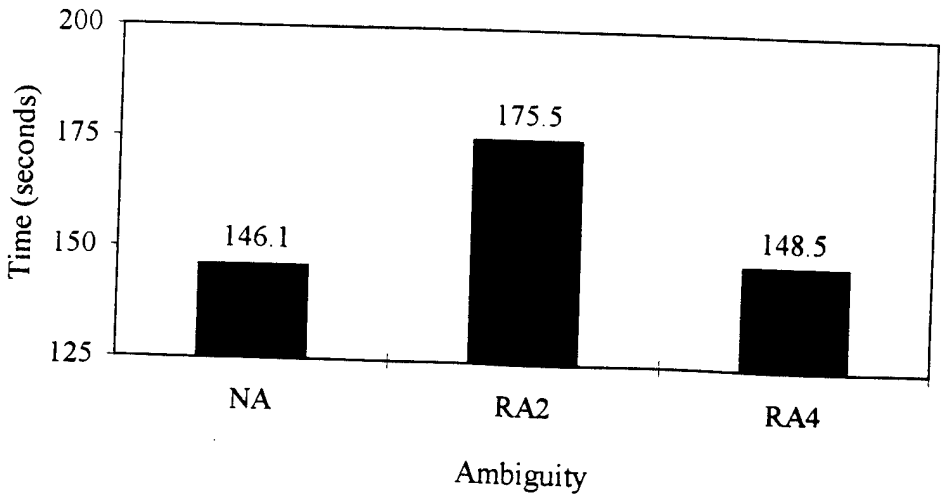
Figure 3. Search Index as a Function of Ambiguity



As stated before, this result does not support Hypothesis #1a and the explanation of the type of decision strategy employed as a function of environmental complexity. How, then, can this result be explained? Perhaps additional information will help clarify the situation.

It was also found that ambiguity had a significant polynomial effect upon the time taken by the subject to complete the decision task $F(2,72) = 2.894$ $p<0.05$. Specifically, decision-makers tended to take more time under RA_2 conditions ($M = 174.5$ seconds) than under the other conditions of ambiguity ($M = 146.1$ seconds and $M = 148.5$ seconds for NA and RA_4, respectively). These findings are summarized in Figure 4:

Figure 4. Processing Time as a Function of Ambiguity

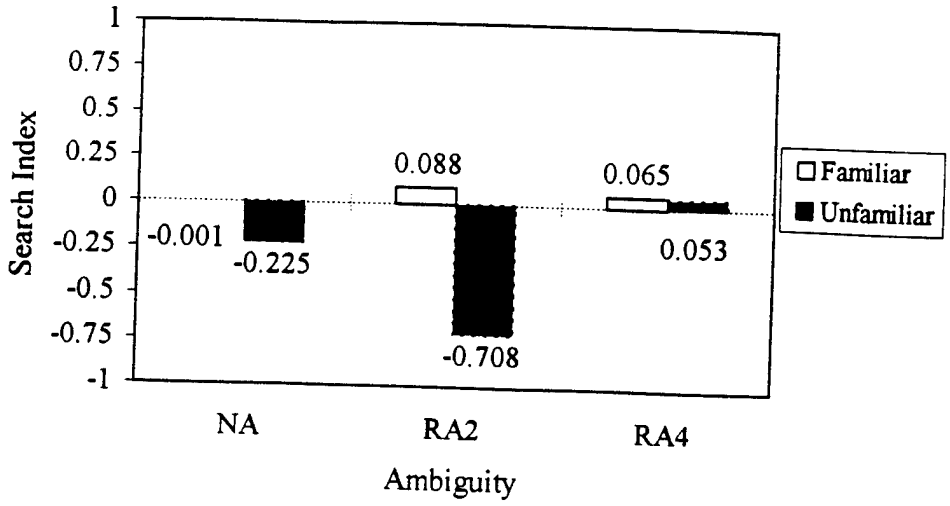


Given both of the above findings, these results may be explained in terms of the 'U-curve hypothesis' (Schroder *et al.* 1967; see also Streufert and Swezey 1986). As argued by Schroder *et al.*, the level of information processing tends to reach "a maximum level of structural complexity at some optimal level of environmental complexity. . . Increasing or decreasing environmental complexity from the optimal point lowers the conceptual level, as indicated by a reduction in the level of information processing involved in behavior" (*Ibid.*, 36). In this case, subjects tended to take more time utilizing dimensional strategies under conditions of mid-level ambiguity, while in the other conditions they took less time even when pursuing an alternative-based search strategy. This suggests that the subjects may have operated at a higher level of information processing (to use the terminology of Schroder *et al.* 1967) under 'optimal' conditions of ambiguity than in the other conditions of ambiguity.

Confirming prior research, as well as Hypothesis #1b, ANOVA analyses also revealed a strong effect of familiarity on the overall search index $F(1,72) = 4.103$ $p<0.03$. Under conditions of familiarity, subjects tended to utilize a more alternative-based strategy ($M = 0.130$), than when the subjects were unfamiliar with the choice set, in which they tended to utilize a more dimensional search ($M = -0.293$). As noted by Mintz *et al.*, "this contrast can be explained in terms of the complexity of the decision task: as would be expected, the unfamiliar scenario 'dictates' that subjects expend more effort in processing information necessary to making a choice. In attempting to deal with this increased complexity, decision makers employ the simplifying heuristic of dimension-based processing" (1996, 16).

The relationship becomes somewhat more complex, however, when considering the interaction between ambiguity and familiarity. The effect, depicted in Figure 5, is not as strong as the above findings, $F(1,72) = 1.902$ $p<0.08$, but still indicates an important trend:

Figure 5. Search Index as a Function of Ambiguity and Familiarity



As implied by the interaction illustrated in Figure 5, the major impact of ambiguity on decision strategy is in the unfamiliar choice set, while the impact of ambiguity in the familiar choice set is negligible. This can be explained by the subject's increased dependence on information in the unfamiliar choice set. In this condition, the decision-maker does not enjoy *a priori* knowledge of the alternatives or their consequences and must, therefore, depend more upon the information provided to them. As a result, they are much more susceptible to the effects of ambiguity, as described above, than those decision-makers faced with a familiar decision environment. Hence, as depicted above, a curvilinear relationship exists between ambiguity and search index in the unfamiliar setting. Specifically, the subjects tended to utilize a more dimension-based strategy under conditions of mid-level ambiguity (M = -0.708) than under the other conditions (M = -0.225 and M = 0.053 for NA and RA_4, respectively). Therefore, this result is considered to be supportive of Hypothesis #1c.

Strategy Change

In addition to examining strategy selection, this research project also tested whether subjects changed strategies during the decision-making process. As with previous research, changes in strategy were identified by comparing the search pattern (search index) for the first six items of information opened (Stage 1) with that of the remaining items of information (Stage 2).[7] This measurement scheme reflects the two-stage decision process posited by Mintz and Geva (1994) and discussed in Section 3.

This study found that, overall, there was a significant difference—$F(1,72) = 7.508$ $p<0.01$—between Stage 1 search indices ($M = -0.254$—indicating more dimension-based processing) and that of Stage 2 ($M = -0.038$—indicating a more alternative-based strategy). This implies that decision-makers did indeed change decision strategies during the decision process; a finding that supports both the primary tenet of the poliheuristic theory and Hypothesis #2a.

To test for the effects of ambiguity and familiarity on changes in strategy selection during the decision task, the degree to which subjects tended to change strategy between the two stages of the process was calculated for each experimental condition (0 denoting no change in strategy and 1 signifying a difference between Stage 1 and Stage 2 search strategies).[8]

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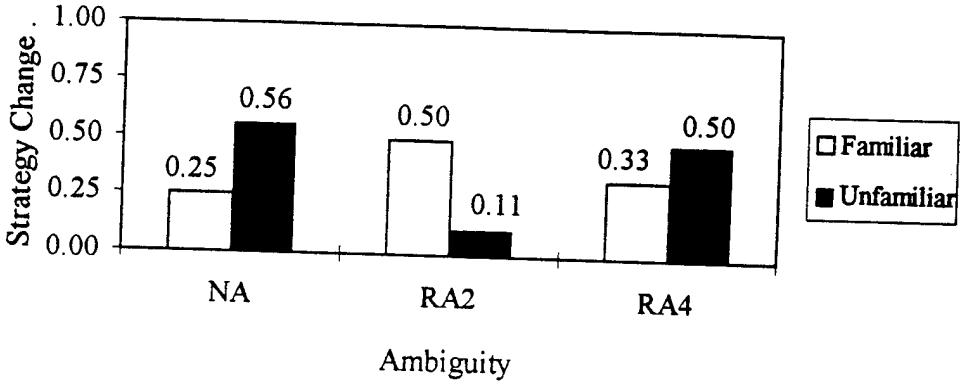
[7] It is important to note that this is an arbitrary measurement convention used to identify changes in decision strategy.

[8] A score of 1 was tallied if the difference between Stage 1 and Stage 2 search indices was larger than 0.5 and in different directions (alternative versus dimensional).

ANOVA analyses showed that, while neither ambiguity nor familiarity alone had significant effects upon changes in strategy selection (a finding unsupportive of Hypothesis #2b), there was a significant interaction effect between the two, $F(2,72) = 2.439$ $p<0.05$, as portrayed in Figure 6:

Figure 6. Strategy Change as a Function of Ambiguity and Familiarity



Under conditions of low ambiguity (NA), subjects in the familiar decision setting tended undergo little change in their decision strategies between Stage 1 ($M = -0.05$—indicating a mixed decision strategy) and Stage 2 ($M = -0.159$—indicative of a slightly dimension-based strategy) of the decision process. Those subjects who were faced with an unfamiliar decision setting, however, demonstrated a greater tendency to change their decision strategy through the course of the decision task than did those in the familiar setting. Specifically, those in the unfamiliar and low-ambiguity decision setting tended to initially rely on a

dimension-based search strategy (M = -0.383) and then switch to a less dimensional strategy in the second stage (M = -0.056).

This relationship turns out be quite similar to that which occurs under conditions of high ambiguity. In the case of high ambiguity, decision-makers in the familiar decision setting tended to experience little change in their decision strategy, relying on a mixed decision strategy throughout the decision process (M = 0.011 in Stage 1 and M = 0.026 in Stage 2). As above, those unfamiliar to the decision task experienced a greater degree of change in their decision strategies (M = -0.164 in Stage 1 and M = 0.218 in Stage 2).

Under conditions of mid-level ambiguity, however, decision-makers familiar with the choice set demonstrated a much greater propensity to change their strategy toward an alternative-based mode (M = -0.042 in Stage 1; M = 0.224 in Stage 2). On the other hand, those in the unfamiliar decision task underwent much less change in their decision strategy. In fact, the subjects began the decision task with a strong dimensional strategy (M = -0.833) and ended with an only slightly less dimensional strategy (M = -0.485).

How is this relationship to be explained? Under conditions of low ambiguity and unfamiliarity, the subjects were able to eliminate alternatives and then move to a more holistic examination of the remaining options before they made their decision. As ambiguity increased, however, the subjects were forced to rely much more on eliminating alternatives before they could move a more holistic search due to their reliance on the information in order to make sense of an unfamiliar and an ambiguous environment. As those cognitive stressors increased even further, however, the subjects demonstrated a renewed tendency to

change strategy during the decision process. Recalling that the subjects tended to take less time under high ambiguity conditions, this finding suggests that the decision-makers may have traded the dimension-based heuristic for a "time-based heuristic". In other words, while the dimension-based heuristic may have served well under conditions of mid-level ambiguity, under higher levels of ambiguity it may cost too much in terms of time and effort. Instead, decision-makers seemed to utilize the same two-stage framework to organize their information search, but then 'skimmed' through the information at a much quicker pace. As a result, they traded the quality of their decision and decision process for time and volume of information concerns.

While not readily apparent, the familiar case represents a similar progression. Under conditions of low ambiguity, the subjects demonstrated a rapid decision process that experienced little change in strategy. Since this was the experimental condition with the lowest cognitive strain, this suggests that the decision-makers may have simply skimmed through the information, again trading process concerns for time concerns. As the cognitive strain increased due to rising ambiguity, however, the subjects demonstrated a greater concern for process by utilizing a more two-stage process. As ambiguity continued to rise, however, the decision-makers reverted back to a single strategy throughout the decision process in order to alleviate growing cognitive strain. Following the logic for the condition of unfamiliarity and high ambiguity, it is possible that had ambiguity continued to rise (and match the cognitive strain present in the unfamiliar/high-ambiguity case), those decision-makers familiar with the decision environment may have, once again, moved to a more two-stage process but taken even less time to process information for the decision.

Choice

In addition to studying the strategies employed by decision-makers and how they are affected by the decision environment, this paper is also concerned with explicating the effect of ambiguity on choice via decision strategy. As was noted in Section 4, the subjects' propensity to choose the alternative that maximizes utility is referred to as accuracy. In this particular experiment, the fourth alternative (A_4) was given the highest expected utility across all levels of ambiguity and, thus, "its selection by the subjects constitutes the 'correct' choice in this specific context" (Mintz *et al.* 1996, 20).

Unfortunately, decision strategy was found to have no statistically significant effect on choice. Table 1 depicts computed proportions of accuracy as a function of decision strategy used under varying conditions of ambiguity:

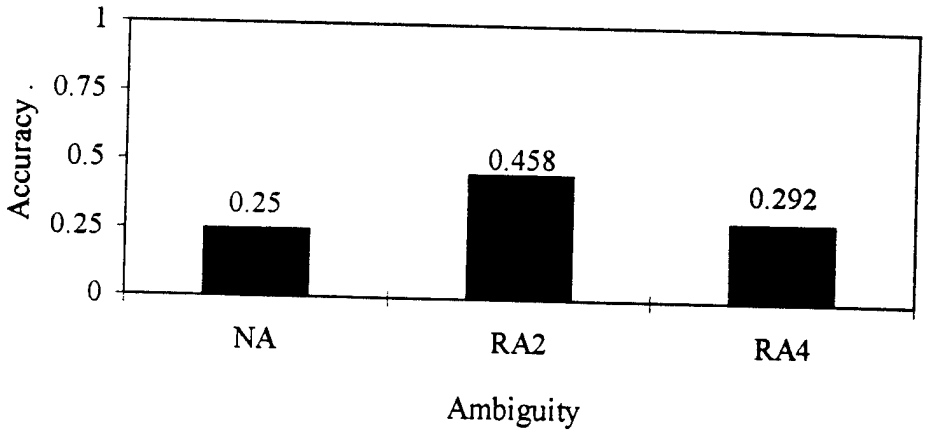
Table 1. Accuracy as a Function of Decision Strategy and Ambiguity

Strategy	NA	RA_2	RA_4
Dimension-Based (Search Index <-0.3)	7.69%	20.51%	5.1%
Alternative-Based (Search Index >0.3)	10.35%	6.90%	13.71%

A chi-square analysis of decision strategy on accuracy did not yield any significant relationships between decision strategy and choice ($X^2 = 0.610$, n.s.). While this result does not support Hypothesis #3, Table 1 does indicate at least one interesting effect. It seems that under conditions of mid-range ambiguity, subjects tended to make better decisions using a dimension-based strategy than those that used an alternative-based decision strategy.

Although this effect is insignificant, it suggests that there may be some relationship between ambiguity and choice; however, contrary to the hypothesized relationship, that the effect may be independent of decision strategy. Indeed, it was found that ambiguity and choice were curvilinearly related. An analysis of the relationship using a polynomial contrast revealed that ambiguity did, indeed, have a curvilinear effect upon choice $F(2,72) = 2.684$ $p<0.06$. Specifically, decision-makers were more likely to select the optimum choice in the presence of mid-level ambiguity than in the other conditions, as is depicted in Figure 7:

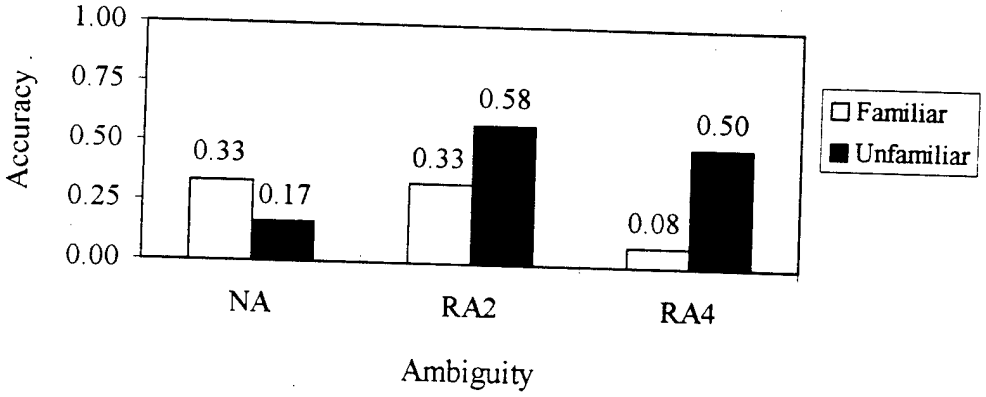
Figure 7. Correct Choice as a Function of Ambiguity



As with decision strategy, these results may be explained by the 'U-curve' hypothesis. Recall, this hypothesis argues that the level of information processing is curvilinearly related to the level of complexity in the environment (Schroder *et al.* 1967, 36). Provided that a higher level of information processing is directly related to the propensity of making the correct choice, then this argument implies that accuracy is also curvilinearly related to complexity. In terms of this study, accuracy is curvilinearly related to the level of ambiguity, as is shown in Figure 7 above.

Likewise, it was found that the interaction between ambiguity and familiarity also had a significant impact upon choice $F(1,72) = 2.584$ $p<0.05$. Figure 8 depicts this relationship:

Figure 8. Correct Choice as a Function of Ambiguity and Familiarity



Again, it was found that ambiguity had its strongest effect in the unfamiliar decision setting. For the same reasons as given above with respect to the interaction's effect on decision

strategy, decision-makers seem to be more susceptible to the effects of ambiguity in the unfamiliar choice set. This finding is, however, quite interesting since it indicates that the presence of ambiguity may actually serve to *improve* the quality of the decision in some cases. One should note, however, the sharp drop in the percentage of those selecting the correct choice in the case of high ambiguity and familiar choice set—ambiguity may not always be a good thing, especially in the familiar choice setting.

SECTION 7

CONCLUSION

Experience demonstrates that crisis decision-making is subject to a great many factors. Familiarity with the decision environment, uncertainty, risk, complexity, time constraints, ambiguity—all of these characteristics of a decision environment can have a significant impact upon the process and outcome of a foreign policy decision task. The question of whether the presence of these factors is 'a good thing' or not is, therefore, central to the study of how foreign policy decision-makers cope with their decision environment. Specifically, this thesis has attempted to conceptualize the notion of ambiguity and explicate its effect upon decision strategy and choice.

Ambiguity was first discussed and defined in relation to other, salient characteristics of the decision environment. While the other characteristics (complexity, risk, and uncertainty) certainly have a relevant place in foreign policy decision-making research, it was argued that ambiguity should number among them.

The thesis then moved on to identify several possible heuristics that decision-makers may utilize in order to cope with ambiguity in the decision environment. Specifically, decision-makers may utilize non-compensatory, non-holistic, dimension-based search, or satisficing heuristics to help alleviate cognitive strain in the information search/cognitive calculation stages of decision-making. Given that decision-makers may utilize several different strategies in a single decision task, the poliheuristic theory of decision was then

presented and posited to be the most applicable theory to the study of ambiguity in the decision environment.

The implications of the poliheuristic theory of decision for ambiguity's effect on decision strategy and choice were then explored. At this point, several hypotheses were explicated: first, that rising ambiguity would lead to increasingly dimensional search strategies; second, that decision-makers would tend to remain in Stage 1 of the decision process longer under conditions of rising ambiguity; third, that accuracy would decrease as the decision process became more dimensional (a result of rising ambiguity); fourth, that the familiar choice set would lead to more alternative-based processing; and, finally, that familiarity would mediate the effects of ambiguity.

While the results did not necessarily bear out the entire set of hypotheses, they did provide extremely interesting findings worthy of further inquiry. Contrary to the first hypothesis, it was found that decision strategy varies curvilinearly with ambiguity. While this finding contradicts much of the research positing a linear relationship, it is supportive of other research which identifies curvilinear relationships between stress and performance (see Schroder *et al.* 1967; Streufert and Swezey 1986). Findings with respect to familiarity, however, did confirm prior research. Specifically, it was found that decision-makers experience higher cognitive strain under unfamiliar conditions and that familiarity has a significant mediating effect on ambiguity.

With respect to strategy change, it was found that, while decision-makers did tend to change decision strategy in the course of the decision task, ambiguity and familiarity had a

significant impact upon this process. Basically, it was discovered that the use of a dimension-based search strategy alone may not adequately mediate the effects of the environment. On the contrary, decision-makers may utilize combinations of a number of different strategies in order to cope with increasing cognitive strain. For example, it was found that, in some cases, decision-makers tended to utilize a dimension-based search strategy, while in other, more stressful decision tasks, subjects actually tended to utilize more alternative-based strategies. At the same time, however, they took significantly less time to perform the decision task; a finding that suggests that another heuristic, a time-based heuristic, could have been at work.

One of the most interesting findings was with respect to choice. Contrary to the hypothesized relationship (Hypothesis 3), it was found that accuracy did not vary as a function of decision strategy; another finding which contradicts previous research. Instead, accuracy was found to be directly affected by the decision environment (ambiguity) independently of decision strategy. Moreover, it was found that increasing ambiguity may actually have served to *improve* decision accuracy. Again, this finding contradicts previous research in this area (see Herek *et al.* 1987; Stein and Tanter 1980).

While these results provide an interesting counterpoint to the current state of foreign policy decision-research, it is important to reiterate that due to a small number of subjects the results reported herein require additional replication. Nevertheless, these results do present a coherent, if not complex, picture of decision-making. In addition, steps taken to improve both internal and external validity make these results even more important. With

respect to internal validity concerns, a previously tested research methodology (namely, the foreign policy decision board platform—see Mintz and Geva 1996) was utilized to conduct an analysis of foreign policy decision-making. As a result, this research in many ways replicates previous research (Mintz and Geva 1996; Mintz *et al.* 1995; 1996) and, thus, attends to internal validity concerns. Concerns of external validity are addressed through the use of U.S. military officers as subjects. As was discussed in Section 5, these individuals possess experience dealing with decisions relating to national security and are, therefore, considered provide more external validity to the research than would the 'typical' subject—the college student. Given all of this, further research into ambiguity and its effect on decision strategy and choice is warranted so as to help stabilize these findings.

Another possible vein of further research could incorporate the tenets of prospect theory (Kahneman and Tversky 1979), specifically examining decision-maker's tendencies to operate in either a domain of gain or that of loss. Such research would attempt to identify which value in the range holds greater importance for the decision-maker. In other words, does the decision-maker tend to concentrate on the low-end of the range of possible outcomes (possibly implying operation in the domain of loss) or does he/she look to the high-end of that range (perhaps suggesting more emphasis on the domain of gain)?

Yet another possibility would be to study non-constant range ambiguity. Recall that, in this research project, the range between evaluations was kept constant within each condition of ambiguity. This does not, however, have to be the case. Within a single decision, some alternatives may have greater costs associated with greater benefits; or, some

alternatives may represent a cautious course of action in which the range between possible outcomes is extremely small.

Further research into the intricacies of decision-making is, no doubt, necessary. As has been demonstrated by this research, the decision environment can have a very complex effect upon decision strategy and choice. In some cases it can serve to damage the prospects of successfully dealing with a situation, while in others it may actually improve a decision-maker's hopes of making the best choice. Perhaps, then, a more thorough understanding of how the decision environment affects decision-making may help foreign policy decision-makers prepare for and take advantage of that environment to serve their purposes. In spite of President John F. Kennedy's reservations—"...it is mysterious because the essence of ultimate decision remains impenetrable to the observer—often, indeed, to the decider himself" (1963, *xi*)—hopefully, with a great deal of further research and practical experience, we can eventually shed light on the essence of decision.

REFERENCES

Allison, Graham T. 1971. *Essence of Decision: Explaining the Cuban Missile Crisis.* Boston: Little, Brown and Company.

Billings, Robert S., and Thomas W. Milburn. 1976. "Decision-Making Perspectives from Psychology." *American Behavioral Scientist* 20:111-26.

Billings, Robert S., and Lisa L. Scherer. 1988. "The Effects of Response Mode and Importance on Decision-Making Strategies: Judgment Versus Choice." *Organizational Behavior and Human Decision Processes* 41:1-19.

Brown, Seyom. 1994. *The Causes and Prevention of War.* New York: St. Martin's.

Bueno de Mesquita, Bruce, and David Lalman. 1992. "Five Democratic Puzzles." In *War and Reason: Domestic and International Imperatives*, ed. Bruce Bueno de Mesquita and David Lalman. New Haven, CT: Yale University Press.

Burke, John P., and Fred I. Greenstein. 1989. *How Presidents Test Reality: Decisions on Vietnam, 1954 & 1965.* New York: Russell Sage Foundation.

Campbell, Donald J., and K. Gingrich. 1986. "The Interactive Effects of Task Complexity and Participation on Task Performance: A Field Experiment." *Organizational Behavior and Human Decision Processes* 38:162-80.

Cyert, Richard M., and James G. March. 1963. *A Behavioral Theory of the Firm.* Englewood Cliffs, NJ: Prentice-Hall.

Dougherty, James E., and Robert L. Pfaltzgraff, Jr. 1990. *Contending Theories of International Relations.* New York: Harper Collins.

Einhorn, Hillel J., and Robin M. Hogarth. 1985. "Ambiguity and Uncertainty in Probabilistic Inference." *Psychological Review* 92:433-60.

Ellsberg, Daniel. 1961. "Risk, Ambiguity, and the Savage Axioms." *Quarterly Journal of Economics* 75:643-69.

Heradstveit, Daniel, and G. Matthew Bonham. 1986. "Decision-Making in the Face of Uncertainty: Attributions of Norwegian and American Officials." *Journal of Peace Research* 23:339-56.

Herek, Gregory, Irving Janis, and Paul Huth. 1987. "Decision Making During International Crises: Is Quality of Process Related to Outcome?" *Journal of Conflict Resolution* 31:203-26.

James, Patrick, and John R. Oneal. 1991. "The Influence of Domestic and International Politics on the President's Use of Force." *Journal of Conflict Resolution* 35:307-32.

Jervis, Robert. 1976. *Perception and Misperception in International Politics.* Princeton: Princeton University Press.

Jones, Bryan D. 1994. *Reconceiving Decision-Making in Democratic Politics.* Chicago: University of Chicago Press.

Kahneman, Daniel, and Amos Tversky. 1979. "Prospect Theory: An Analysis of Decision Under Risk." *Econometrica* 47:263-91.

Kahneman, Daniel, and Amos Tversky. 1982. "Variants of Uncertainty." *Cognition* 11:143-57.

Kennedy, John F. 1963. "Forward." In *Decision-Making in the White House*, ed. Theodore Sorensen. New York: Columbia University Press.

Kirkpatrick, Samuel A., Dwight F. Davies, and Roby Robertson. 1976. "The Process of Political Decision-Making in Groups: Search Behavior and Choice Shifts." *American Behavioral Scientist* 20:33-64.

Latham, G., and G. Yukl. 1975. "A Review of Research on the Application of Goal-Setting in Organizations." *Academy of Management Journal* 18:824-45.

Levin, M. 1971. "Hypothesis Theory and Nonlearning Despite Ideal S-R Reinforcement Contingencies." *Psychological Review* 78:130-40.

Levine, Donald M. 1985. *The Flight From Ambiguity.* Chicago: The University of Chicago Press.

Levy, Jack S. 1992. "An Introduction to Prospect Theory." *Political Psychology* 13:171-86.

Maoz, Zeev. 1981. "The Decision to Raid Entebbe: Decision Analysis Applied to Crisis Behavior." *Journal of Conflict Resolution* 25:677-707.

March, James G., and Herbert A. Simon. 1958. *Organizations*. New York: John Wiley.

March, James G., and Johan P. Olsen. 1979. *Ambiguity and Choice in Organizations*. Oslo: Universitetsforlaget.

Mintz, Alex. 1993. "The Decision to Attack Iraq: A Noncompensatory Theory of Decision-making." *Journal of Conflict Resolution* 37:595-618.

Mintz, Alex, and Nehemia Geva. 1996. "The Poliheuristic Theory of Foreign Policy Decision-making." In *Decision-Making on War and Peace: The Cognitive-Rational Debate*, ed. Nehemia Geva and Alex Mintz. Boulder, Lynne Rienner. Forthcoming.

Mintz, Alex, Nehemia Geva, and Karl DeRouen. 1994. "Mathematical Models of Foreign Policy Decision-making: Compensatory vs. Noncompensatory." *Sythese*. Forthcoming.

Mintz, Alex, Nehemia Geva, Steven B. Redd, and Amy Carnes. 1995. "The Impact of Dynamic and Static Choice Sets on Political Decision-making: An Analysis Utilizing the Decision Board Platform." Presented at the annual meeting of the International Studies Association, Chicago.

Mintz, Alex, Nehemia Geva, and Steven B. Redd. 1996. "Structure and Process in Foreign Policy Decision-Making: An Experimental Assessment of Poliheuristic Propositions." Presented at the annual meeting of the International Studies Association, San Diego.

Morgan, T. Clifton, and Kenneth N. Bickers. 1992. "Domestic Discontent and the External Use of Force." *Journal of Conflict Resolution* 36:25-52.

Morrow, James D. 1995. "A Rational Choice Approach to International Conflict." In *Decision-Making on War and Peace: The Cognitive-Rational Debate*, ed. Nehemia Geva and Alex Mintz. Boulder: Lynne Rienner. Forthcoming.

Olshavsky, R. 1979. "Task Complexity and Contingent Processing in Decision-Making: A Replication and Extension." *Organizational Behavior and Human Performance* 24:300-16.

Ostrom, Charles W., and Brian L. Job. 1986. "The President and the Political Use of Force." *American Political Science Review* 80:541-66.

Payne, John W. 1976. "Task Complexity and Contingent Processing in Decision-Making: An Information Search and Protocol Analyis." *Organizational Behavior and Human Performance* 22:17-44.

Payne, John W., James R. Bettman, and Eric Johnson. 1992. "Behavioral Decision Research: A Constructive Processing Perspective." *Annual Review of Psychology* 43:87-131.

Payne, John W., James R. Bettman, and Eric Johnson. 1993. *The Adaptive Decision Maker.* Cambridge: Cambridge University Press.

Russett, Bruce M., and Harvey Starr. 1992. *World Politics: The Menu for Choice*, 4th ed. New York: W.H. Freeman and Co.

Russo, J. Edward, and Barbara Anne Dosher. 1983. "Strategies for Multiattribute Binary Choice." *Journal of Experimental Psychology: Learning, Memory, and Cognition* 9:676-96.

Russo, J. Edward, and L. R. Rosen. 1975. "An Eye Fixation Analysis of Multialternative Choice." *Memory and Cognition* 3:267-76.

Schroder, Harold M., Michael J. Driver, and Siegfried Streufert. 1967. *Human Information Processing.* New York: Holt, Rinehart, and Winston.

Schwenk, Charles R. 1984. "Cognitive Simplification Processes in Strategic Decision-Making." *Strategic Management Journal* 5:111-28.

Simon, Herbert A. 1956. "Rational Choice and the Structure of the Environment." *Psychological Review* 63:129-38.

Stein, Janice, and Raymond Tanter. 1980. *Rational Decision Making: Israel's Security Choices, 1967.* Columbus: Ohio State University Press.

Steinbruner, John D. 1974. *The Cybernetic Theory of Decision: New Dimensions of Political Analysis.* Princeton: Princeton University Press.

Stone, Dan N., and David A. Schkade. 1991. "Numeric and Linguistic Information Representation in Multiattribute Choice." *Organizational Behavior and Human Decision Processes* 49:42-59.

Streufert, Siegfried, and Robert W. Swezey. 1986. *Complexity, Managers, and Organizations.* Orlando: Academic Press.

Taber, Charles, and Marco R. Steenbergen. 1994. "Computational Experiments in Electoral Behavior." In *Political Information Processing*, ed. Lodge and McGraw. Forthcoming.

Vertzberger, Yaacov Y. I. 1990. *The World in Their Minds: Information Processing, Cognition, and Perception in Foreign Policy Decision-making.* Stanford: Stanford University Press.

Walker, Stephen G. 1983. "The Motivational Foundations of Political Belief System: A Re-Analysis of the Operational Code Constraint." *International Studies Quarterly* 27:179-201.

Walker, Stephen G. 1986. "Operational Codes and Content Analysis: The Case of Henry Kissinger." In *Different Text Analysis: Procedures for the Studies of Decision Making*, ed. I. N. Gallhofer, W. E. Saris, and M. Melman. Amsterdam: Sociometric Research Foundation.

Weiss, Janet A. 1982. "Coping with Complexity: An Experimental Study of Public Policy Decision-Making." *Journal of Policy Analysis and Management* 2:66-87.

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